

Appl. No. 10/694,263
Reply to Office Action of January 24, 2006

REMARKS

Applicants thank the Examiner for acknowledging receipt of the Applicants' certified priority document that has been submitted pursuant to 35 USC section 119. Applicants also thank the Examiner for acknowledging acceptance of the formal drawings that were previously submitted.

Applicants respectfully request reconsideration of the prior art rejections set forth by the Examiner under 35 USC sections 102 and 103. Applicants respectfully submit that the prior art references of record, whether considered alone, or in combination, fail to either teach or suggest Applicants' presently claimed invention.

More specifically, Applicants' claimed invention is directed to a polishing method for polishing a metal film formed on a wafer surface which is comprised of a step of polishing the metal film by alternating an electropolishing with a chemical mechanical polishing or chemical buffing. See, for example, independent claim 6 and the remaining independent claims.

Advantageously, in accordance with the claimed invention, by polishing the metal film and alternating the electropolishing with chemical mechanical polishing or chemical buffing, the metal film surface is roughened by the electropolishing so that a high polish rate is attained and because the electropolished surface is also polished by chemical mechanical polishing or chemical buffing, it is possible to obtain a high quality polished surface such as that which is attained through chemical mechanical polishing or chemical buffing alone. Because electropolishing and chemical mechanical polishing or chemical buffing are alternately applied, it is possible to achieve both a high polish rate and high quality for the

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resultant product surfaced. Applicants respectfully submit that the prior art references of record, provide no teaching or suggestion whatsoever regarding this advanced in the art.

Applicants have demonstrated that by using be techniques described in the instant application, a substantial improvement in throughput can be achieved with reference to the prior art. For example, Figure 5 illustrates that the combined multiple steps of electropolishing and chemical mechanical polishing or chemical buffing provides the most desirable results. More specifically, none of the prior art references of record provides any teaching or suggestion whatsoever regarding Applicants' presently claimed invention. In accordance with the claimed invention, alternating electropolishing with chemical mechanical polishing or chemical buffing results in the most efficient processing of the devices.

In order to highlight the distinctions between the prior art and the presently claimed invention, Applicants have added new claims which alternately define the invention over the prior art. New independent claim 12 specifies that there be a separate step of chemical mechanical polishing. New independent claim 16 specifies that there is a step of polishing said metal film by alternating an electropolishing with a chemical mechanical polishing or chemical buffing, and wherein there is at least two separate steps of electropolishing and two separate steps of chemical mechanical polishing or chemical buffing. Applicants submit that there is no teaching or suggestion whatsoever regarding this advance and the art.

Figure 5 illustrates the advantages of using Applicants technique for alternately applying electropolishing and chemical mechanical polishing or chemical buffing. As demonstrated in the instant specification, the use of the alternate processing techniques provides a significant advance in throughput while maintaining a high quality output product.

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The prior art provides no teaching or suggestion regarding the advantages of the claimed approach. Applicants respectfully submit that the presently claimed invention is neither obvious in light of nor anticipated by the prior art cited by the Examiner. For the sake of clarity, Applicants note that the Examiner has failed to demonstrate how the prior art renders the claimed subject matter in valid.

In regard to the rejection of claims 6 and 7, the Examiner has asserted that the Uzoh reference describes the process as electrochemical mechanical polishing and that the method of operation of the device in Figure 11b would act as the claimed invention when the cathode was below the wafer surface with chemical mechanical polishing when the pad 64 is in contact with the wafer surface. This characterization set forth by the Examiner does not accurately describe the subject matter of the prior art. The portion of the reference cited by the Examiner is merely directed to operation of the device so that an electrical connection of the conductive platen to ground is not required. The illustrations of Figure 11 b are directed to the removable cathodes and does not describe alternate electropolishing and chemical mechanical polishing or chemical buffing as asserted by the Examiner.

Additionally, contrary to the assertions of the Examiner, the Sharan reference neither anticipates nor renders obvious the claimed subject matter. Specifically, the Sharan prior art reference merely describes control of the electrochemical process such that the voltage or current may be turned on and off. This is clearly not a sequence of alternating chemical mechanical polishing and electropolishing as specified in the present specification. Rather, the Sharan prior art reference describes a single process wherein the processing parameters are adjusted which is significantly different from alternating electropolishing and chemical

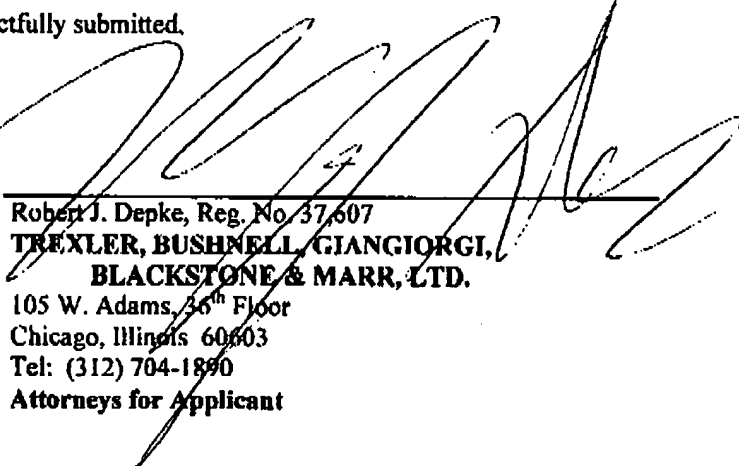
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mechanical polishing or chemical buffing as specified in the claims of the incident application.

In light of the foregoing, Applicants respectfully submit that the Examiner has failed to demonstrate how the prior art anticipates or renders obvious the claimed subject matter. Accordingly, in light of the foregoing, Applicants respectfully submit that the prior art references of record provide no teaching or suggestion whatsoever regarding this advance the art.

Respectfully submitted,

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